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(NASA-CR-143375) IN VIVO MEASUREMENT OF  
HUMAN BODY COMPOSITION Semiannual Status  
Report, 1 Jul. - 31 Dec. 1974 (California  
Univ.) 76 p HC \$4.75

N75-30774

CSCL 06P

Unclass

G3/52 34255

IN VIVO MEASUREMENT OF HUMAN BODY COMPOSITION

NASA Grant NGR 05-003-470

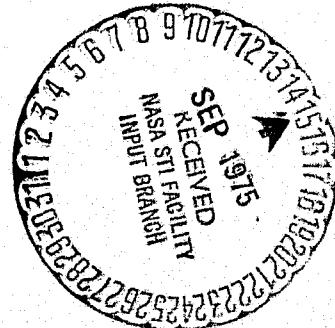
SEMI-ANNUAL STATUS REPORT NO. 5

1 July 1974 - 31 December 1974

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IN VIVO MEASUREMENT OF HUMAN BODY COMPOSITION

During late July, August and early September, 1974 this laboratory participated in a human body study at the NASA Ames Research Center designed to examine the time course of a number of the physiological changes that occur during the first 21 days of continuous bed rest. The test involved a total of 14 men in the age range of 25 to 36 years, who were divided into 4 groups of 3 or 4 men each and tested on a staggered schedule in the NASA/Ames Human Research Facility. Dr. Harold Sandler, Chief, Biomedical Research Division, NASA Ames Research Center, was the Principal Investigator for the entire experiment, and Dr. Charles M. Winget, Human Studies Branch, NASA Ames Research Center, served as Project Manager.

In each case, the members of a subject group entered the Human Research Facility and remained ambulatory for 8 days before the bed-rest period began, in order to provide base-line information. The 3 men of Group A were scheduled for 3 days of continuous recumbency, the 4 men of Group B for 7 days, the 3 men of Group C for 14 days, and the 4 men of Group D for 21 days. The schedule was arranged in such a way that our laboratory (UCB) performed base-line tests on all the subjects 1 to 2 days before their bed-rest period started. The UCB measurements on Group A were repeated on Day 2 of bed rest, and on Group B they were repeated on Day 2 and Day 6. On Group C, the UCB measurements were repeated in 2 of the subjects on Day 6 of bed rest, and in 1 subject on Day 12 of bed rest. On Group D, the UCB measurements were repeated in 3 of the subjects on Day 13 and Day 19 of bed rest. The schedule followed for the UCB measurements is shown in Table 1.

The UCB test procedures were of two categories: *in vivo* body compartment measurements made at the NASA/Ames Human Research Facility as scheduled in Table 1, and subsequent laboratory analyses of various constituents of blood samples and 24-hr urine collections obtained on the same days shown in Table 1. The *in vivo* measurements included determination of total body water by isotopic dilution of 300  $\mu$ Ci of  $^3\text{H}_2\text{O}$ , 12 hours after ingestion in 100 ml  $\text{H}_2\text{O}$ . Plasma volume was measured by the intravenous injection of 25 mg of T-1824 dye, and red cell volume was measured by injection of a 20 ml suspension of the subject's own erythrocytes after labeling them outside the body with 20  $\mu$ Ci of  $^{51}\text{Cr}$ .

The blood samples were analyzed for hemoglobin concentration and venous hematocrit value. Blood plasma was separated and analyzed for potassium, sodium, calcium, magnesium, chloride and total protein concentration. A plasma protein electrophoretogram was prepared for determination of plasma albumin, globulins and fibrinogen levels. Plasma levels of the enzymes alkaline phosphatase (ALP), glutamate-oxaloacetate transaminase (GOT), glutamate-pyruvate transaminase (GPT), and lactate dehydrogenase (LDH) were measured. Finally, the 5 lactate dehydrogenase isozymes were determined electrophoretically.

A number of parameters were derived secondarily from the primary measurements listed above. Blood volume was computed as the sum of plasma volume and red cell volume. Body hematocrit value was obtained as the quotient of red cell volume divided by blood volume. Body/venous hematocrit ratio was computed as the quotient of body hematocrit value divided by venous hematocrit value. Mean corpuscular hemoglobin concentration (MCHC) was calculated as the quotient of blood hemoglobin level divided by venous hematocrit value. Circulating hemoglobin was computed as the product of MCHC and red cell volume. Circulating quantities of the various plasma proteins and enzymes were obtained as the product of plasma constituent concentration and plasma volume.

The results of the *in vivo* measurements and of the blood analyses are reported herein. The 24-hr urine analyses could not be completed during the period of this report, and will be presented in the next report.

Table 2 identifies the subjects comprising each of the 4 groups tested, and gives their vital statistics. Table 3 rearranges this same information in terms of the data groupings examined to ascertain the effects of different periods of bed rest in the subjects. It will be noted that subjects of Groups B and C appear twice in the listings because of the identicity of the duration of continuous bed rest when the measurements were made, as provided by the schedule shown in Table 1. It will also be noted that the groupings in Table 3 eliminate, as appropriate, the subjects who were studied early in the experiment, but who dropped out during the course of the project. These groupings permitted statistical evaluation by paired t-test of differences seen between the base values and each period of continuous bed rest indicated.

All the *in vivo* body compartment data and blood constituent data obtained by our laboratory during the 1974 NASA/Ames Time Course Bed-Rest Study, tabulated according to the group and date arrangements shown in Tables 1 and 2, are listed by parameter in Tables 4 to 51. The same data, appropriately selected and arranged as in Table 3 for paired comparison, are given in Tables 52-67. Also shown in the latter tables are the mean, standard deviation and standard error for each parameter base value before bed rest and value on the day of bed rest indicated. The absolute difference between the base mean and the bed-rest mean, the percentage of the base mean represented by the bed-rest mean, and the probability by paired t-test that the base mean and bed-rest mean are not statistically distinguishable are given for each parameter at the bottom of Tables 52-67.

Table 68 summarizes the percentage changes for each body composition and blood parameter examined during the course of the 1974 NASA/Ames study. The values shown represent the bed-rest mean values as a percentage of the base mean value for the particular group involved, and were taken from Tables 52-67. The statistically significant differences are indicated.

Generally, it may be seen that the various groups of subjects maintained body weight during the study. However, it should be noted that the 6-Day group did lose an average of 3.3 kg, a statistically significant decrement.

Significant net loss of body water, amounting to 0.6 liters, had occurred by Day 2 of bed rest, and by Day 6 had reached 0.9 liters. The net loss of body water on Day 19 was 1.0 liter, or about 2%.

Plasma volume and red cell volume both revealed significant reductions of 3-4% by Day 2, and even greater reductions of 9-10% by Day 6. As in the case of the body water loss, the reductions in plasma volume and red cell volume, and hence in blood volume, seemed to stabilize at 8-9% by Day 19.

From these results, it appears that the major body fluid loss characteristically associated with continuous recumbency requires 2 to 6 days to reach completion. It may be predicted, therefore, that the principal shifts in fluid balance seen in weightlessness occur during the first week of space flight. Hence, they are amenable to study within the framework of the projected 7-day Shuttle flights.

The standard hematological parameters examined in the present study revealed no significant changes during its course. These included body hematocrit value, venous hematocrit value, body/venous hematocrit ratio, blood hemoglobin concentration, and mean corpuscular hemoglobin concentration. However, when total circulating hemoglobin was computed, it was found to be significantly reduced by Day 2 and even lower on Day 6. Although statistical

significance was not achieved after Day 6, the circulating hemoglobin tended to be low to Day 19. The implication of this finding is that, like the fluid balance changes, the erythropoietic adjustments during continuous recumbency and weightlessness probably occur fairly promptly in the first few days.

The plasma electrolytes measured in the present study comprised potassium, sodium, calcium, magnesium and chloride. Of these, calcium level was slightly elevated on Day 2 of bed rest, and chloride levels were somewhat reduced on Days 12-19 of bed rest. The remainder of the electrolyte values showed no change during bed rest. The general conclusion to be drawn is that plasma electrolyte levels seem to have been little affected in this study.

As in previous bed-rest studies, the concentrations of the major plasma proteins exhibited no consistent changes. However, when the circulating quantities were examined it was found that in the first week of bed rest the amount of circulating albumin was significantly reduced. Circulating fibrinogen was also significantly reduced on Day 2 of bed rest. After longer periods of bed rest the amounts of these proteins in the circulation appeared to be the same as the base values, whereas the amount of circulating globulins seemed to be diminished. The decrease appeared to be primarily in the  $\alpha$ -1-globulin and  $\alpha$ -2-globulin fractions, but was not statistically demonstrable because of the smaller number of subjects for the longer bed-rest periods. The dynamic changes in plasma protein quantities that occur in bed rest, and presumably in weightlessness, are undoubtedly concomitant with the fluid balance changes, and are deserving of further careful study.

Among the plasma enzymes measured, glutamate-oxaloacetate transaminase and glutamate-pyruvate transaminase showed no change as a function of bed rest in these subjects. Alkaline phosphatase showed a transitory rise on Day 6 of bed rest, but little can be concluded from this finding.

Probably the most interesting finding from our part of the study is the changes that took place in plasma lactate dehydrogenase values. As a result of recent significant improvements made by this laboratory in the standard electrophoretic analysis of the lactate dehydrogenase isozymes, it was possible to carry out substantially more accurate determinations than heretofore possible. In agreement with the findings from the two previous bed-rest studies in which we participated, plasma total lactate dehydrogenase levels were significantly reduced after 2 weeks of bed rest. However, when the individual isozyme levels were examined it was found that on Day 2 of bed rest LDH-1 levels were significantly depressed and LDH-2 levels tended to be low. LDH-3 levels were unchanged, while LDH-4 and LDH-5 levels were significantly elevated. By Day 6 of bed rest, this pattern had reversed itself so that LDH-1 and LDH-2 levels now tended to be higher than the base values, whereas LDH-4 and LDH-5 levels were lower than their base values. This trend continued to become more exaggerated so that by Day 19, LDH-1 and LDH-2 levels were quite high while LDH-4 and LDH-5 levels were exceptionally low. When the amounts of circulating isozymes were examined, it was evident that the same pattern of change had occurred, with LDH-4 and LDH-5 practically disappearing from the circulation.

Biochemically, the LDH isozymes are made up of 4 subunits, known as monomers, of 2 different chemical structures. One kind of subunit is designated as monomer H (heart), and the other kind is designated as monomer M (muscle). When the tetrameric structure of the five LDH isozymes is examined, the following arrangement of constituent monomers is found:

LDH-1	=	HHHH
LDH-2	=	HHHM
LDH-3	=	HHMM
LDH-4	=	HMMM
LDH-5	=	MMMM

Metabolically, it is found that the LDH-1 and LDH-2 tetramers arise primarily from heart and red blood cells, whereas the LDH-4 and LDH-5 tetramers come chiefly from skeletal muscle and liver cells. It is of great interest, therefore, that in the first few days of bed rest the LDH-1 and LDH-2 tetramers should be reduced in amount, while the LDH-4 and LDH-5 tetramers should be elevated. As bed rest continues, this pattern of change is apparently reversed so that after 2-3 weeks of continuous recumbency the plasma LDH is made up almost entirely of LDH-1, LDH-2 and LDH-3, while LDH-4 and LDH-5 have practically disappeared from the circulation. The implication is clear that a major change in skeletal muscle cell metabolism with regard to this important blood enzyme occurs during continuous recumbency, and more detailed investigation of the phenomenon is warranted. The further implications of the finding for study of the changes in skeletal muscle function associated with weightlessness are also of manifest importance.

**Table 1. Schedule of tests performed by the investigators from the University of California, Berkeley (UCB) on the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.**

Date	Group A	Group B	Group C	Group D
22 Jul 74	Enter Facility			
23 Jul 74		Enter Facility		
28 Jul 74	UCB Base Values			
30 Jul 74	Begin Bed Rest	UCB Base Values		
31 Jul 74	UCB Day-2 Values	Begin Bed Rest		
1 Aug 74		UCB Day-2 Values		
5 Aug 74		UCB Day-6 Values		
11 Aug 74				Enter Facility
12 Aug 74			Enter Facility	
17 Aug 74				UCB Base Values
19 Aug 74			UCB Base Values	Begin Bed Rest
20 Aug 74			Begin Bed Rest	
25 Aug 74			UCB Day-6 Values	
31 Aug 74			UCB Day-12 Values	UCB Day-13 Values
6 Sep 74				UCB Day-19 Values

**Table 2. Identification and vital statistics for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.**

Subject	Name	Age (yr)	Height (cm)	Weight (kg)	Surface Area (m <sup>2</sup> )
<b>Group A</b>					
STE	Kim E. Sterling	30	186	78.0	2.02
BRO	Robert C. Brown	36	185	93.6	2.18
KUB	Art M. Kubersky	33	168	73.3	1.83
<b>Group B</b>					
CUT	Robert E. Cutting	28	184	87.0	2.10
JON	Thomas W. Jones	27	180	74.0	1.93
SHA	Jimmie X. Shaw	26	183	71.1	1.92
JSM	Joe W. Smith	27	190	89.2	2.17
<b>Group C</b>					
REE	Harry Reece	25	179	71.3	1.89
MEI	Maurice E. Meikle	32	182	83.6	2.05
GRI	Mike W. Griffith	26	178	91.7	2.10
<b>Group D</b>					
CAR	Patrick J. Carson	28	183	77.8	2.00
FIE	Marshall G. Fiegener	34	185	76.4	2.00
GOO	Alan E. Goodwin	28	183	97.6	2.20
BAR	Joey M. Barrios	30	173	90.7	2.04

**Table 3.** Identification and vital statistics for the subjects, by experiment groups, of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Name	Age (yr)	Height (cm)	Weight (kg)	Surface Area (m <sup>2</sup> )
<b>2-Day Group</b>					
STE	Kim E. Sterling	30	186	78.0	2.02
BRO	Robert C. Brown	36	185	93.6	2.18
KUB	Art M. Kubersky	33	168	73.3	1.83
CUT	Robert E. Cutting	28	184	87.0	2.10
JON	Thomas W. Jones	27	180	74.0	1.93
SHA	Jimmie X. Shaw	26	183	71.1	1.92
JSM	Joe W. Smith	27	190	89.2	2.17
Mean		30	182	80.9	2.02
S.D.		4	7	8.9	0.13
<b>6-Day Group</b>					
CUT	Robert E. Cutting	28	184	87.0	2.10
JON	Thomas W. Jones	27	180	74.0	1.93
SHA	Jimmie X. Shaw	26	183	71.1	1.92
JSM	Joe W. Smith	27	190	89.2	2.17
MEI	Maurice E. Meikle	32	182	83.6	2.05
GRI	Mike W. Griffith	26	178	91.7	2.10
Mean		28	183	82.8	2.05
S.D.		2	4	8.4	0.10
<b>12-13-Day Group</b>					
GRI	Mike W. Griffith	26	178	91.7	2.10
CAR	Patrick J. Carson	28	183	77.8	2.00
FIE	Marshall G. Fiegener	34	185	76.4	2.00
GOO	Alan E. Goodwin	28	183	97.6	2.20
Mean		29	182	85.9	2.08
S.D.		3	3	10.4	0.10
<b>19-Day Group</b>					
CAR	Patrick J. Carson	28	183	77.8	2.00
FIE	Marshall G. Fiegener	34	185	76.4	2.00
GOO	Alan E. Goodwin	28	183	97.6	2.20
Mean		30	184	83.9	2.07
S.D.		3	1	11.9	0.12

Table 4. Body weight (kg) for the subjects of the 1974  
NASA/Ames Time Course Bed-Rest Study.

Subject				
<u>Group A</u>		28 Jul	31 Jul	
STE		78.0	71.8	
BRO		93.6	98.7	
KUB		73.3	73.1	
<u>Group B</u>		30 Jul	1 Aug	5 Aug
CUT		87.0	87.0	84.2
JON		74.0	72.5	72.5
SHA		71.1	75.1	68.0
JSM		89.2	88.9	80.9
<u>Group C</u>		19 Aug	25 Aug	31 Aug
REE		71.3	--	--
MEI		83.6	82.4	--
GRI		91.7	88.8	93.7
<u>Group D</u>		17 Aug		31 Aug 6 Sep
CAR		77.8		79.5 76.1
FIE		76.4		78.2 77.6
GOO		97.6		93.2 92.5
BAR		90.7		-- --

Table 5. Body water (liters) for the subjects of the 1974  
NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	50.1	49.1	
BRO	61.9	61.3	
KUB	42.0	41.3	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	59.6	59.5	58.8
JON	53.2	52.7	52.0
SHA	51.8	52.0	51.0
JSM	59.9	58.7	58.7
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	52.6	--	--
MEI	54.9	--	--
GRI	50.0	49.4	49.2
<u>Group D</u>	17 Aug		31 Aug
CAR	47.3		46.5
FIE	48.2		47.2
GOO	55.7		54.8
BAR	49.4		--
			6 Sep

**Table 6. Plasma volume (liters) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.**

<b>Subject</b>			
<b>Group A</b>	<b>28 Jul</b>	<b>31 Jul</b>	
STE	3.00	2.95	
BRO	4.10	3.80	
KUB	2.60	2.37	
<b>Group B</b>	<b>30 Jul</b>	<b>1 Aug</b>	<b>5 Aug</b>
CUT	3.99	3.82	3.51
JON	3.10	3.03	2.68
SHA	3.13	3.08	2.92
JSM	3.48	3.46	3.16
<b>Group C</b>	<b>19 Aug</b>	<b>25 Aug</b>	<b>31 Aug</b>
REE	3.02	--	--
MEI	3.26	--	--
GRI	3.23	2.98	3.18
<b>Group D</b>	<b>17 Aug</b>		<b>31 Aug</b>
CAR	2.78		2.76
FIE	3.28		3.16
GOO	3.74		3.51
BAR	3.28		--
			<b>6 Sep</b>

Table 7. Red cell volume (liters) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject			
<u>Group A</u>	28 Jul	31 Jul	
STE	2.08	1.93	
BRO	3.03	2.83	
KUB	1.80	1.65	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	2.50	2.48	2.26
JON	2.24	2.23	1.98
SHA	2.58	2.48	2.38
JSM	2.57	2.51	2.28
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	2.26	--	--
MEI	2.18	--	--
GRI	2.39	2.27	2.25
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	1.94		1.85 1.73
FIE	2.25		2.13 1.97
GOO	2.45		2.41 2.32
BAR	2.21		-- --

Table 8. Blood volume (liters) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	5.08	4.88	
BRO	7.13	6.63	
KUB	4.40	4.02	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	6.49	6.30	5.77
JON	5.34	5.26	4.66
SHA	5.71	5.56	5.30
JSM	6.05	5.97	5.44
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	5.28	--	--
MEI	5.44	--	--
GRI	5.62	5.25	5.43
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	4.72		4.61 4.34
FIE	5.53		5.29 4.90
GOO	6.19		5.92 5.79
BAR	5.49		-- --

**Table 9.** Body hematocrit value (%) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject			
<u>Group A</u>	28 Jul	31 Jul	
STE	40.9	39.5	
BRO	42.5	42.7	
KUB	40.9	41.0	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	38.5	39.4	39.2
JON	41.9	42.4	42.5
SHA	45.2	44.6	44.9
JSM	42.5	42.0	41.9
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	42.8	--	--
MEI	40.1	--	--
GRI	42.5	43.2	41.4
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	41.1		40.1 39.9
FIE	40.7		40.3 40.2
GOO	39.6		40.7 40.1
BAR	40.3		-- --

Table 10. Venous hematocrit value (%) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject			
<u>Group A</u>	28 Jul	31 Jul	
STE	47.0	45.0	
BRO	44.0	48.0	
KUB	45.0	47.5	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	44.0	45.0	44.0
JON	48.5	49.5	47.5
SHA	51.5	50.0	52.5
JSM	48.0	48.0	48.5
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	48.5	--	--
MEI	45.0	46.0	--
GRI	48.5	49.0	47.0
<u>Group D</u>	17 Aug		31 Aug
CAR	47.0		43.5
FIE	48.0		47.0
GOO	46.0		46.0
BAR	46.0		--
			6 Sep

Table 11. Body/venous hematocrit ratio for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	0.87	0.88	
BRO	0.97	0.89	
KUB	0.91	0.86	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	0.88	0.88	0.89
JON	0.86	0.86	0.89
SHA	0.88	0.89	0.86
JSM	0.89	0.88	0.86
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	0.88	--	--
MEI	0.89	--	--
GRI	0.88	0.88	0.88
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	0.87		0.92 0.86
FIE	0.85		0.86 0.87
GOO	0.86		0.88 0.86
BAR	0.88		-- --

Table 12. Blood hemoglobin concentration (g/100 ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject			
<u>Group A</u>	28 Jul	31 Jul	
STE	16.7	17.2	
BRO	16.3	18.0	
KUB	15.0	16.3	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	16.1	15.7	15.8
JON	17.3	17.3	17.2
SHA	17.9	17.3	18.6
JSM	16.7	16.6	17.5
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	17.7	--	--
MEI	16.8	16.4	--
GRI	17.8	17.5	16.3
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	16.5		15.7 16.7
PIE	16.4		16.2 16.4
GOO	15.6		15.5 16.3
BAR	15.8		-- --

**Table 13.** Mean corpuscular hemoglobin concentration (g Hb/100 ml RBC) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<b>Subject</b>			
<b>Group A</b>	<b>28 Jul</b>	<b>31 Jul</b>	
STE	35.5	38.2	
BRO	37.0	37.5	
KUB	33.3	34.3	
<b>Group B</b>	<b>30 Jul</b>	<b>1 Aug</b>	<b>5 Aug</b>
CUT	36.6	34.9	35.9
JON	35.7	34.9	36.2
SHA	34.8	34.6	35.4
JSM	34.8	34.6	36.1
<b>Group C</b>	<b>19 Aug</b>	<b>25 Aug</b>	<b>31 Aug</b>
REE	36.5	--	--
MEI	37.3	35.7	--
GRI	36.7	35.7	34.7
<b>Group D</b>	<b>17 Aug</b>		<b>31 Aug</b>
CAR	35.1		36.1
FIE	34.2		34.5
GOO	33.9		33.7
BAR	34.3		--
			<b>6 Sep</b>

Table 14. Circulating hemoglobin (g) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	738	737	
BRO	1,121	1,061	
KUB	599	566	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	915	866	811
JON	800	778	717
SHA	898	858	843
JSM	894	868	823
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	825	--	--
MEI	813	--	--
GRI	877	810	781
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	681		668 621
FIE	770		735 703
GOO	831		812 814
BAR	758		-- --

**Table 15.** Plasma potassium concentration (meq/liter) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<b>Subject</b>				
<b>Group A</b>		<b>28 Jul</b>	<b>31 Jul</b>	
STE		3.97	4.04	
BRO		4.57	4.50	
KUB		4.29	4.12	
<b>Group B</b>		<b>30 Jul</b>	<b>1 Aug</b>	<b>5 Aug</b>
CUT		4.21	4.12	4.04
JON		4.29	4.38	4.04
SHA		4.29	4.50	4.38
JSM		4.04	4.00	4.12
<b>Group C</b>		<b>19 Aug</b>	<b>25 Aug</b>	<b>31 Aug</b>
REE		4.12	--	--
MEI		4.25	4.12	--
GRI		4.41	4.12	3.88
<b>Group D</b>		<b>17 Aug</b>		<b>31 Aug</b>
CAR		3.80		3.88
FIE		4.29		4.12
GOO		3.80		3.75
BAR		3.68		--
				<b>6 Sep</b>

**Table 16. Plasma sodium concentration (meq/liter) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.**

<b>Subject</b>			
<b>Group A</b>	<b>28 Jul</b>	<b>31 Jul</b>	
STE	141	143	
BRO	143	149	
KUB	143	149	
<b>Group B</b>	<b>30 Jul</b>	<b>1 Aug</b>	<b>5 Aug</b>
CUT	146	144	143
JON	146	149	144
SHA	144	145	144
JSM	144	146	143
<b>Group C</b>	<b>19 Aug</b>	<b>25 Aug</b>	<b>31 Aug</b>
REE	150	--	--
MEI	146	146	--
GRI	145	151	145
<b>Group D</b>	<b>17 Aug</b>		<b>31 Aug</b>
CAR	145		143
FIE	147		145
GOO	145		145
BAR	151		--
			<b>6 Sep</b>
			140
			139
			144

Table 17. Plasma calcium concentration (meq/liter) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject			
<u>Group A</u>	28 Jul	31 Jul	
STE	4.39	4.54	
BRO	4.54	4.85	
KUB	4.39	4.54	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	4.26	4.70	4.54
JON	4.54	4.54	4.70
SHA	4.70	4.70	4.85
JSM	4.54	4.70	4.70
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	4.85	--	--
MEI	4.70	4.70	--
GRI	4.85	4.54	4.54
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	4.84		5.00 4.85
FIE	4.84		4.70 4.56
GOO	4.53		4.70 4.70
BAR	4.53		-- --

Table 18. Plasma magnesium concentration (meq/liter) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	1.72	1.64	
BRO	1.48	1.60	
KUB	1.68	1.64	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	1.52	1.60	1.56
JON	1.72	1.68	1.72
SHA	1.52	1.56	1.60
JSM	1.64	1.60	1.56
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	1.80	--	--
MEI	1.68	1.69	--
GRI	1.64	1.65	1.58
<u>Group D</u>	17 Aug		31 Aug
CAR	1.72		1.62
FIE	1.80		1.62
GOO	1.56		1.62
BAR	1.64		--
			6 Sep

Table 19. Plasma chloride concentration (meq/liter) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject			
<u>Group A</u>	28 Jul	31 Jul	
STE	102.5	104.5	
BRO	107.0	107.0	
KUB	103.0	105.0	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	100.5	97.5	100.0
JON	103.5	103.5	103.5
SHA	100.5	105.0	101.0
JSM	102.5	106.0	99.0
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	104.5	--	--
MEI	101.5	105.0	--
GRI	104.0	106.0	103.5
<u>Group D</u>	17 Aug		31 Aug
CAR	106.0		99.0
FIE	108.5		102.0
GOO	105.5		100.5
BAR	108.0		--
			6 Sep

Table 20. Plasma protein concentration (g/100 ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	5.72	6.22	
BRO	6.08	6.61	
KUB	6.28	6.53	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	7.01	6.72	6.62
JON	6.53	6.52	6.54
SHA	7.04	6.67	7.46
JSM	7.32	6.52	6.95
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	7.20	--	--
MEI	6.82	7.10	--
GRI	7.02	6.85	6.78
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	7.15		7.05 7.13
FIE	6.77		6.60 6.21
GOO	7.08		6.95 6.82
BAR	6.47		-- --

Table 21. Plasma albumin concentration (g/100 ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	3.84	3.52	
BRO	3.42	3.21	
KUB	3.29	3.20	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	3.75	3.31	3.28
JON	3.44	3.38	3.39
SHA	3.37	3.23	3.54
JSM	3.89	3.36	3.22
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	3.38	--	--
MEI	3.69	3.65	--
GRI	3.60	3.50	3.48
<u>Group D</u>	17 Aug		31 Aug
CAR	4.04		3.97
FIE	3.41		3.95
GOO	3.70		3.93
BAR	3.51	--	--

Table 22. Plasma globulins concentration (g/100 ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	1.51	2.26	
BRO	2.03	2.73	
KUB	2.30	2.68	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	2.49	2.82	2.65
JON	2.39	2.58	2.57
SHA	2.80	2.81	3.18
JSM	2.79	2.61	3.13
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	3.10	--	--
MEI	2.54	2.71	--
GRI	2.75	2.45	2.50
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	2.56		2.35 2.46
FIE	2.66		2.03 1.90
GOO	2.73		2.41 2.34
BAR	2.35		-- --

Table 23. Plasma fibrinogen concentration (g/100 ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject				
<u>Group A</u>		28 Jul	31 Jul	
STE		0.37	0.44	
BRO		0.63	0.67	
KUB		0.69	0.65	
<u>Group B</u>		30 Jul	1 Aug	5 Aug
CUT		0.77	0.59	0.69
JON		0.70	0.56	0.58
SHA		0.87	0.63	0.74
JSM		0.64	0.55	0.60
<u>Group C</u>		19 Aug	25 Aug	31 Aug
REE		0.72	--	--
MEI		0.59	0.74	--
GRI		0.67	0.90	0.80
<u>Group D</u>		17 Aug	31 Aug	6 Sep
CAR		0.55	0.73	0.73
FIE		0.70	0.62	0.66
GOO		0.65	0.61	0.50
BAR		0.61	--	--

Table 24. Plasma albumin/globulin ratio for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	2.54	1.56	
BRO	1.68	1.18	
KUB	1.43	1.19	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	1.51	1.17	1.24
JON	1.44	1.31	1.32
SHA	1.20	1.15	1.11
JSM	1.39	1.29	1.03
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	1.09	--	--
MEI	1.45	1.35	--
GRI	1.31	1.43	1.39
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	1.58		1.69 1.60
FIE	1.28		1.95 1.92
GOO	1.36		1.63 1.70
BAR	1.49		-- --

Table 25. Circulating plasma protein (g) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	172	183	
BRO	249	251	
KUB	163	155	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	280	257	232
JON	202	198	175
SHA	220	205	218
JSM	255	226	220
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	217	--	--
MEI	222	--	--
GRI	227	204	216
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	199		195 186
FIE	222		209 182
GOO	265		244 237
BAR	212		-- --

Table 26. Circulating plasma albumin (g) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject			
<u>Group A</u>	28 Jul	31 Jul	
STE	115	104	
BRO	140	122	
KUB	86	76	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	150	126	115
JON	107	102	91
SHA	105	99	103
JSM	135	116	102
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	102	--	--
MEI	120	--	--
GRI	116	104	111
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	112		110 103
FIE	112		125 107
GOO	138		138 138
BAR	115		-- --

Table 27. Circulating plasma globulins (g) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject			
<u>Group A</u>	28 Jul	31 Jul	
STE	45.3	66.7	
BRO	83.2	103.7	
KUB	59.8	63.5	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	99.4	107.7	93.0
JON	74.1	78.2	68.9
SHA	87.6	86.5	92.9
JSM	97.1	90.3	98.9
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	93.6	--	--
MEI	82.8	--	--
GRO	88.8	73.0	79.5
<u>Group D</u>	17 Aug		31 Aug
CAR	71.2		64.9
FIE	87.2		64.1
GOO	102.1		84.6
BAR	77.1		--
			6 Sep

Table 28. Circulating plasma fibrinogen (g) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	11.1	13.0	
BRO	25.8	25.5	
KUB	17.9	15.4	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	30.7	22.5	24.2
JON	21.7	17.0	15.5
SHA	27.2	19.4	21.6
JSM	22.3	19.0	19.0
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	21.7	--	--
MEI	19.2	--	--
GRI	21.6	26.8	25.4
<u>Group D</u>	17 Aug	31 Aug	6 Sep
CAR	15.3	20.1	19.1
FIE	23.0	19.6	19.3
GOO	24.3	21.4	17.4
BAR	20.0	--	--

Table 29. Plasma  $\alpha$ -1-globulin concentration (g/100 ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	0.11	0.22	
BRO	0.10	0.28	
KUB	0.16	0.23	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	0.18	0.26	0.20
JON	0.13	0.25	0.29
SHA	0.18	0.24	0.25
JSM	0.22	0.17	0.24
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	0.25	--	--
MEI	0.18	0.17	--
GRI	0.25	0.13	0.21
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	0.19		0.20 0.19
FIE	0.26		0.12 0.11
GOO	0.20		0.14 0.11
BAR	0.21		-- --

**Table 30. Plasma  $\alpha$ -2-globulin concentration (g/100 ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.**

<b>Subject</b>			
<b>Group A</b>	<b>28 Jul</b>	<b>31 Jul</b>	
STE	0.48	0.50	
BRO	0.53	0.76	
KUB	0.60	0.68	
<b>Group B</b>	<b>30 Jul</b>	<b>1 Aug</b>	<b>5 Aug</b>
CUT	0.56	0.68	0.56
JON	0.53	0.64	0.55
SHA	0.71	0.69	0.80
JSM	0.64	0.62	0.71
<b>Group C</b>	<b>19 Aug</b>	<b>25 Aug</b>	<b>31 Aug</b>
REE	0.78	--	--
MEI	0.56	0.59	--
GRI	0.71	0.69	0.66
<b>Group D</b>	<b>17 Aug</b>		<b>31 Aug</b>
CAR	0.63		0.56
FIE	0.79		0.53
GOO	0.63		0.47
BAR	0.59		--
			<b>6 Sep</b>

Table 31. Plasma  $\beta$ -globulin concentration (g/100 ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	0.48	0.85	
BRO	0.63	0.77	
KUB	0.77	0.92	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	0.86	0.91	1.03
JON	0.93	0.88	0.98
SHA	1.02	0.94	1.11
JSM	0.92	0.82	0.90
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	0.79	--	--
MEI	1.02	1.03	--
GRI	0.80	0.82	0.76
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	1.02		0.93 0.99
FIE	0.92		0.85 0.77
GOO	0.92		0.78 0.81
BAR	0.88		-- --

Table 32. Plasma  $\gamma$ -globulin concentration (g/100 ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	0.44	0.69	
BRO	0.77	0.92	
KUB	0.77	0.85	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	0.89	0.97	0.86
JON	0.80	0.81	0.75
SHA	0.89	0.94	1.02
JSM	1.01	1.00	1.28
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	1.28	--	--
MEI	0.78	0.92	--
GRI	0.99	0.81	0.87
<u>Group D</u>	17 Aug		31 Aug
CAR	0.72		0.66
FIE	0.69		0.53
GOO	0.98		1.02
BAR	0.67		--
			6 Sep

Table 33. Circulating  $\alpha$ -1-globulin (g) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	3.3	6.5	
BRO	4.1	10.6	
KUB	4.2	5.5	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	7.2	9.9	7.0
JON	4.0	7.6	7.8
SHA	5.6	7.4	7.3
JSM	7.7	5.9	7.6
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	7.6	--	--
MEI	5.9	--	--
GRI	8.1	3.9	6.7
<u>Group D</u>	17 Aug		31 Aug
CAR	5.3		5.5
FIE	8.5		3.8
GOO	7.5		4.9
BAR	6.9		--
			6 Sep

Table 34. Circulating  $\alpha$ -2-globulin (g/100 ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

**Subject**

**Group A**

	28 Jul	31 Jul
STE	14.4	14.8
BRO	21.7	28.9
KUB	15.6	16.1

**Group B**

	30 Jul	1 Aug	5 Aug
CUT	22.3	26.0	19.7
JON	16.4	19.4	14.7
SHA	22.2	21.3	23.4
JSM	22.3	21.5	22.4

**Group C**

	19 Aug	25 Aug	31 Aug
REE	23.6	--	--
MEI	18.3	--	--
GRI	22.9	20.6	21.0

**Group D**

	17 Aug	31 Aug	6 Sep
CAR	17.5	15.5	14.9
FIE	25.9	16.7	14.9
GOO	23.6	16.5	13.5
BAR	19.4	--	--

Table 35. Circulating  $\beta$ -globulin (g) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject			
<u>Group A</u>	28 Jul	31 Jul	
STE	14.4	25.1	
BRO	25.8	29.3	
KUB	20.0	21.8	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	34.3	34.8	36.2
JON	28.8	26.7	26.3
SHA	31.9	28.9	32.4
JSM	32.0	28.4	28.4
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	23.9	--	--
MEI	33.3	--	--
GRI	25.8	24.4	24.2
<u>Group D</u>	17 Aug		31 Aug
CAR	28.4		25.7
FIE	30.2		26.9
GOO	34.4		27.4
BAR	28.9		--
			6 Sep

Table 36. Circulating  $\gamma$ -globulin (g) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	13.2	20.4	
BRO	31.6	35.0	
KUB	20.0	20.1	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	35.5	37.1	30.2
JON	24.8	24.5	20.1
SHA	27.9	28.9	29.8
JSM	35.1	34.6	40.4
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	38.7	--	--
MEI	25.4	--	--
GRI	32.0	24.1	27.7
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	20.0		18.2 18.5
FIE	22.6		16.7 14.9
GOO	36.7		35.8 35.7
BAR	22.0		-- --

Table 37. Plasma alkaline phosphatase concentration (units/liter) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject			
<u>Group A</u>	28 Jul	31 Jul	
STE	21.1	27.7	
BRO	26.3	38.0	
KUB	26.0	34.0	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	36.0	28.2	36.0
JON	31.9	22.6	32.3
SHA	46.3	35.3	54.1
JSM	28.1	22.9	35.6
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	49.7	--	--
MEI	36.9	48.5	--
GRI	23.8	31.4	28.3
<u>Group D</u>	17 Aug		
CAR	31.1	30.7	31.0
FIE	27.4	31.0	32.6
GOO	32.5	17.0	17.3
BAR	31.1	--	--

Table 38. Plasma glutamate-oxalacetate transaminase concentration (units/ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	27.9	29.2	
BRO	25.0	27.6	
KUB	25.3	30.1	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	35.9	33.4	30.1
JON	28.3	33.7	28.9
SHA	25.3	26.6	26.4
JSM	26.5	27.4	26.1
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	31.0	--	--
MEI	25.6	25.1	--
GRI	26.8	28.3	28.1
<u>Group D</u>	17 Aug		31 Aug
CAR	26.6		25.1
FIE	25.4		26.5
GOO	25.1		25.4
BAR	25.1		--
			6 Sep

Table 39. Plasma glutamate-pyruvate transaminase concentration  
 (units/ml) for the subjects of the 1974 NASA/Ames  
 Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	22.0	25.7	
BRO	20.7	23.0	
KUB	22.4	24.2	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	42.5	38.2	33.0
JON	26.4	26.0	25.0
SHA	20.2	19.5	20.7
JSM	21.5	20.7	19.2
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	33.8	--	--
MEI	22.3	20.4	--
GRI	23.4	24.7	24.2
<u>Group D</u>	17 Aug		
		31 Aug	6 Sep
CAR	22.5	20.9	20.0
FIE	20.4	24.0	26.8
GOO	22.4	23.0	22.9
BAR	23.6	--	--

Table 40. Plasma total lactate dehydrogenase concentration (units/ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject				
<u>Group A</u>		28 Jul	31 Jul	
STE		276	275	
BRO		294	271	
KUB		282	236	
<u>Group B</u>		30 Jul	1 Aug	5 Aug
CUT		257	287	256
JON		260	281	267
SHA		260	305	269
JSM		257	279	262
<u>Group C</u>		19 Aug	25 Aug	31 Aug
REE		274	--	--
MEI		271	250	--
GRI		294	259	245
<u>Group D</u>		17 Aug		31 Aug 6 Sep
CAR		267		259 267
FIE		285		256 254
GOO		264		237 253
BAR		264		-- --

**Table 41.** Plasma LDH-1 isoenzyme concentration (units/ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject				
<u>Group A</u>		28 Jul	31 Jul	
STE		86.4	84.4	
BRO		79.7	66.9	
KUB		79.2	58.1	
<u>Group B</u>		30 Jul	1 Aug	5 Aug
CUT		79.7	61.7	69.6
JON		74.6	33.2	83.3
SHA		81.4	54.0	83.4
JSM		88.2	64.4	89.3
<u>Group C</u>		19 Aug	25 Aug	31 Aug
REE		55.1	--	--
MEI		42.3	71.3	--
GRI		60.9	66.8	65.7
<u>Group D</u>		17 Aug		31 Aug 6 Sep
CAR		56.3		85.5 105.5
FIE		56.4		65.0 93.0
GOO		51.5		62.1 71.1
BAR		51.0		-- --

Table 42. Plasma LDH-2 isoenzyme concentration (units/ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	80.6	77.3	
BRO	85.8	78.9	
KUB	78.7	63.7	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	58.3	65.7	92.7
JON	65.3	37.9	86.5
SHA	76.7	63.7	90.9
JSM	80.4	70.3	85.9
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	78.1	--	--
MEI	77.2	70.5	--
GRI	98.8	78.7	100.0
<u>Group D</u>	17 Aug		31 Aug
CAR	81.7		96.6
FIE	76.7		95.5
GOO	81.3		100.3
BAR	84.2		--
			6 Sep

**Table 43. Plasma LDH-3 isoenzyme concentration (units/ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.**

**Subject**

**Group A**

	<b>28 Jul</b>	<b>31 Jul</b>
STE	60.7	46.5
BRO	71.1	53.4
KUB	66.3	48.1

**Group B**

	<b>30 Jul</b>	<b>1 Aug</b>	<b>5 Aug</b>
CUT	38.3	60.0	65.3
JON	46.3	76.2	59.3
SHA	54.1	67.1	64.6
JSM	50.4	57.8	48.2

**Group C**

	<b>19 Aug</b>	<b>25 Aug</b>	<b>31 Aug</b>
REE	83.6	--	--
MEI	84.8	58.0	--
GRI	74.1	63.2	56.1

**Group D**

	<b>17 Aug</b>	<b>31 Aug</b>	<b>6 Sep</b>
CAR	57.9	45.6	45.7
FIE	67.5	57.1	51.6
GOO	66.8	56.2	66.3
BAR	71.8	--	--

**Table 44.** Plasma LDH-4 isoenzyme concentration (units/ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<b>Subject</b>			
<b><u>Group A</u></b>	<b>28 Jul</b>	<b>31 Jul</b>	
STE	24.6	31.6	
BRO	32.6	37.9	
KUB	30.7	29.5	
<b><u>Group B</u></b>	<b>30 Jul</b>	<b>1 Aug</b>	<b>5 Aug</b>
CUT	25.2	39.0	9.2
JON	30.9	74.7	16.0
SHA	24.7	66.2	15.1
JSM	15.7	46.0	19.4
<b><u>Group C</u></b>	<b>19 Aug</b>	<b>25 Aug</b>	<b>31 Aug</b>
REE	36.2	--	--
MEI	43.1	12.5	--
GRI	34.1	19.2	2.7
<b><u>Group D</u></b>	<b>17 Aug</b>		<b>31 Aug</b>
CAR	36.8		7.5
FIE	37.6		13.3
GOO	33.8		1.9
BAR	38.5		--
			<b>6 Sep</b>

Table 45. Plasma LDH-5 isoenzyme concentration (units/ml) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	23.7	35.2	
BRO	24.7	33.6	
KUB	27.1	36.6	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	55.5	60.6	19.2
JON	42.9	59.0	21.9
SHA	23.1	54.0	15.1
JSM	22.4	40.2	19.4
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	20.8	--	--
MEI	23.6	37.5	--
GRI	26.2	31.1	20.6
<u>Group D</u>	17 Aug		
CAR	34.2		24.1
FIE	46.7		25.1
GOO	30.4		16.6
BAR	18.5		--
			6 Sep

**Table 46.** Circulating total lactate dehydrogenase (1,000 units) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<b>Subject</b>			
<b>Group A</b>	<b>28 Jul</b>	<b>31 Jul</b>	
STE	828	811	
BRO	1,205	1,029	
KUB	733	559	
<b>Group B</b>	<b>30 Jul</b>	<b>1 Aug</b>	<b>5 Aug</b>
CUT	1,025	1,096	898
JON	806	851	716
SHA	814	939	786
JSM	894	965	828
<b>Group C</b>	<b>19 Aug</b>	<b>25 Aug</b>	<b>31 Aug</b>
REE	827	--	--
MEI	883	--	--
GRI	950	772	779
<b>Group D</b>	<b>17 Aug</b>		<b>31 Aug</b>
CAR	742		715
FIE	935		809
GOO	987		832
BAR	866		--
			<b>6 Sep</b>
			697
			744
			878

Table 47. Circulating LDH-1 isoenzyme (1,000 units) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	259	249	
BRO	327	254	
KUB	206	138	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	318	236	244
JON	231	100	223
SHA	255	166	244
JSM	307	223	282
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	166	--	--
MEI	138	--	--
GRI	197	199	209
<u>Group D</u>	17 Aug	31 Aug	6 Sep
CAR	157	236	275
FIE	185	205	272
GOO	193	218	247
BAR	167	--	--

Table 48. Circulating LDH-2 isoenzyme (1,000 units) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject				
<u>Group A</u>		28 Jul	31 Jul	
STE		242	228	
BRO		352	300	
KUB		205	151	
<u>Group B</u>		30 Jul	1 Aug	5 Aug
CUT		233	251	325
JON		202	115	232
SHA		240	196	265
JSM		279	244	272
<u>Group C</u>		19 Aug	25 Aug	31 Aug
REE		236	--	--
MEI		252	--	--
GRI		319	235	318
<u>Group D</u>		17 Aug		31 Aug 6 Sep
CAR		227		266 281
FIE		252		302 308
GOO		304		352 383
BAR		276		-- --

Table 49. Circulating LDH-3 isoenzyme (1,000 units) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	182	137	
BRO	291	203	
KUB	172	114	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	153	229	229
JON	144	231	159
SHA	170	207	189
JSM	175	200	152
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	253	--	--
MEI	276	--	--
GRI	239	188	178
<u>Group D</u>	17 Aug		31 Aug
CAR	161		126
FIE	222		181
GOO	250		197
BAR	236		--
			6 Sep

Table 50. Circulating LDH-4 isoenzyme (1,000 units) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	74	93	
BRO	134	144	
KUB	80	70	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	100	149	33
JON	96	226	43
SHA	77	204	44
JSM	55	159	61
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	109	--	--
MEI	140	--	--
GRI	110	57	9
<u>Group D</u>	17 Aug		31 Aug 6 Sep
CAR	102		21 0.8
FIE	123		42 1.2
GOO	126		7 0.7
BAR	126		-- --

Table 51. Circulating LDH-5 isoenzyme (1,000 units) for the subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

<u>Subject</u>			
<u>Group A</u>	28 Jul	31 Jul	
STE	71	104	
BRO	101	128	
KUB	70	86	
<u>Group B</u>	30 Jul	1 Aug	5 Aug
CUT	221	231	67
JON	133	179	59
SHA	72	166	44
JSM	78	139	61
<u>Group C</u>	19 Aug	25 Aug	31 Aug
REE	63	--	--
MEI	77	--	--
GRI	85	93	65
<u>Group D</u>	17 Aug	31 Aug	6 Sep
CAR	95	66	21
FIE	153	79	12
GOO	114	58	17
BAR	61	--	--

Table 52. Comparison of bed-rest Day 2 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Body Weight, kg	Body Water, liters	Plasma Volume, liters	Red Cell Volume, liters	Blood Volume, liters	Body Hematocrit Value, %	Venous Hematocrit Value, %	Body/Venous Hematocrit ratio	Blood Hemoglobin, g/100 ml	MCHC, g Hb/100 ml RBC	Circulating Hemoglobin, g	Plasma Potassium, meq/liter
<u>Value 1-2 days before bed rest</u>												
STE	78.0	50.1	3.00	2.08	5.08	40.9	47.0	0.87	16.7	35.5	738	3.97
BRO	93.6	61.9	4.10	3.03	7.13	42.5	44.0	0.97	16.3	37.0	1,121	4.57
KUB	73.3	42.0	2.60	1.80	4.40	40.9	45.0	0.91	15.0	33.3	599	4.29
CUT	87.0	59.6	3.99	2.50	6.49	38.5	44.0	0.88	16.1	36.6	915	4.21
JON	74.0	53.2	3.10	2.24	5.34	41.9	48.5	0.86	17.3	35.7	800	4.29
SHA	71.1	51.8	3.13	2.58	5.71	45.2	51.5	0.88	17.9	34.8	898	4.29
JSM	89.2	59.9	3.48	2.57	6.05	42.5	48.0	0.89	16.7	34.8	894	4.04
Mean	80.9	54.1	3.34	2.40	5.74	41.8	46.9	0.89	16.6	35.4	852	4.24
S.D.	8.9	7.0	0.55	0.40	0.91	2.0	2.7	0.04	0.9	1.2	163	0.20
S.E.	3.4	2.6	0.21	0.15	0.34	0.8	1.0	0.01	0.3	0.5	62	0.07
<u>Value on Day 2 of bed rest</u>												
STE	71.8	49.1	2.95	1.93	4.88	39.5	45.0	0.88	17.2	38.2	737	4.04
BRO	98.7	61.3	3.80	2.83	6.63	42.7	48.0	0.89	18.0	37.5	1,061	4.50
KUB	73.1	41.3	2.37	1.65	4.02	41.0	47.5	0.86	16.3	34.3	566	4.12
CUT	87.0	59.5	3.82	2.48	6.30	39.4	45.0	0.88	15.7	34.9	866	4.12
JON	72.5	52.7	3.03	2.23	5.26	42.4	49.5	0.86	17.3	34.9	778	4.38
SHA	75.1	52.0	3.08	2.48	5.56	44.6	50.0	0.89	17.3	34.6	858	4.50
JSM	88.9	58.7	3.46	2.51	5.97	42.0	48.0	0.88	16.6	34.6	868	4.00
Mean	81.0	53.5	3.22	2.30	5.52	41.7	47.6	0.88	16.9	35.6	819	4.24
S.D.	10.5	7.0	0.52	0.40	0.89	1.9	2.0	0.01	0.8	1.6	151	0.22
S.E.	4.0	2.7	0.20	0.15	0.34	0.7	0.7	0.01	0.3	0.6	57	0.08
$\bar{X}_1 - \bar{X}_2$	+0.1	-0.6	-0.12	-0.10	-0.22	-0.1	+0.7	-0.01	+0.3	+0.2	-33	0.00
%	100.1	98.9	96.4	95.8	96.2	99.8	101.5	98.9	101.8	100.6	96.1	100.0
P	0.93	0.023*	0.020*	0.011*	0.009*	0.71	0.41	0.24	0.34	0.74	0.004*	1.00

Table 53. Comparison of bed-rest Day 2 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Plasma Sodium, meq/liter	Plasma Calcium, meq/liter	Plasma Magnesium, meq/liter	Plasma Chloride, meq/liter	Plasma Protein, g/100 ml	Plasma Albumin, g/100 ml	Plasma Globulins, g/100 ml	Plasma Fibrinogen, g/100 ml	Plasma Albumin/Globulin, ratio	Circ. Plasma Protein, g	Circulating Albumin, g	Circulating Globulins, g
<u>Value 1-2 days before bed rest</u>												
STE	141	4.39	1.72	102.5	5.72	3.84	1.51	0.37	2.54	172	115	45.3
BRO	143	4.54	1.48	107.0	6.08	3.42	2.03	0.63	1.68	249	140	83.2
KUB	143	4.39	1.68	103.0	6.28	3.29	2.30	0.69	1.43	163	86	59.8
CUT	146	4.26	1.52	100.5	7.01	3.75	2.49	0.77	1.51	280	150	99.4
JON	146	4.54	1.72	103.5	6.53	3.44	2.39	0.70	1.44	202	107	74.1
SHA	144	4.70	1.52	100.5	7.04	3.37	2.80	0.87	1.20	220	105	87.6
JSM	144	4.54	1.64	102.5	7.32	3.89	2.79	0.64	1.39	255	135	97.1
Mean	144	4.48	1.61	102.8	6.57	3.57	2.33	0.67	1.60	220	120	78.1
S.D.	2	0.14	0.10	2.2	0.58	0.25	0.45	0.15	0.44	44	23	19.8
S.E.	1	0.05	0.04	0.8	0.22	0.09	0.17	0.06	0.17	17	9	7.5
<u>Value on Day 2 of bed rest</u>												
STE	143	4.54	1.64	104.5	6.22	3.52	2.26	0.44	1.56	183	104	66.7
BRO	149	4.85	1.60	107.0	6.61	3.21	2.73	0.67	1.18	251	122	103.7
KUB	149	4.54	1.64	105.0	6.53	3.20	2.68	0.65	1.19	155	76	63.5
CUT	144	4.70	1.60	97.5	6.72	3.31	2.82	0.59	1.17	257	126	107.7
JON	149	4.54	1.68	103.5	6.52	3.38	2.58	0.56	1.31	198	102	78.2
SHA	145	4.70	1.56	105.0	6.67	3.23	2.81	0.63	1.15	205	99	86.5
JSM	146	4.70	1.60	106.0	6.52	3.36	2.61	0.55	1.29	226	116	90.3
Mean	146	4.65	1.62	104.1	6.54	3.32	2.64	0.58	1.26	211	106	85.2
S.D.	3	0.12	0.04	3.1	0.16	0.12	0.19	0.08	0.14	37	17	17.0
S.E.	1	0.04	0.01	1.2	0.06	0.04	0.07	0.03	0.05	14	6	6.4
$\bar{X}_1 - \bar{X}_2$	+2	+0.17	+0.01	+1.3	-0.03	-0.25	+0.31	-0.09	-0.34	-9	-14	+7.1
%	101.4	103.8	100.6	101.3	99.5	93.0	113.3	86.6	78.8	95.9	88.3	109.1
P	0.052	0.028*	0.85	0.22	0.89	0.009*	0.052	0.10	0.034*	0.13	0.003*	0.12

Table 54. Comparison of bed-rest Day 2 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Circulating Fibrinogen, g	Plasma $\alpha$ -1-Globulin, g/100 ml	Plasma $\alpha$ -2-Globulin, g/100 ml	Plasma $\beta$ -Globulin, g/100 ml	Plasma $\gamma$ -Globulin, g/100 ml	Circ. $\alpha$ -1-Globulin, g	Circ. $\alpha$ -2-Globulin, g	Circulating $\beta$ -Globulin, g	Circulating $\gamma$ -Globulin, g	Plasma ALP, units/liter	Plasma GOT, units/ml	Plasma GPT, units/ml
<u>Value 1-2 days before bed rest</u>												
STE	11.1	0.11	0.48	0.48	0.44	3.3	14.4	14.4	13.2	21.1	27.9	22.0
BRO	25.8	0.10	0.53	0.63	0.77	4.1	21.7	25.8	31.6	26.3	25.0	20.7
KUB	17.9	0.16	0.60	0.77	0.77	4.2	15.6	20.0	20.0	26.0	25.3	22.4
CUT	30.7	0.18	0.56	0.86	0.89	7.2	22.3	34.3	35.5	36.0	35.9	42.5
JON	21.7	0.13	0.53	0.93	0.80	4.0	16.4	28.8	24.8	31.9	28.3	26.4
SHA	27.2	0.18	0.71	1.02	0.89	5.6	22.2	31.9	27.9	46.3	25.3	20.2
JSM	22.3	0.22	0.64	0.92	1.01	7.7	22.3	32.0	35.1	28.1	26.5	21.5
Mean	22.4	0.15	0.58	0.80	0.80	5.2	19.3	26.7	26.9	30.8	27.7	25.1
S.D.	6.5	0.04	0.08	0.19	0.19	1.7	3.6	7.2	8.2	8.3	3.8	7.9
S.E.	2.4	0.02	0.03	0.07	0.07	0.6	1.4	2.7	3.1	3.1	1.4	3.0
<u>Value on Day 2 of bed rest</u>												
STE	13.0	0.22	0.50	0.85	0.69	6.5	14.8	25.1	20.4	27.7	29.2	25.7
BRO	25.5	0.28	0.76	0.77	0.92	10.6	28.9	29.3	35.0	38.0	27.6	23.0
KUB	15.4	0.23	0.68	0.92	0.85	5.5	16.1	21.8	20.1	34.0	30.1	24.2
CUT	22.5	0.26	0.68	0.91	0.97	9.9	26.0	34.8	37.1	28.2	33.4	38.2
JON	17.0	0.25	0.64	0.88	0.81	7.6	19.4	26.7	24.5	22.6	33.7	26.0
SHA	19.4	0.24	0.69	0.94	0.94	7.4	21.3	28.9	28.9	35.3	26.6	19.5
JSM	19.0	0.17	0.62	0.82	1.00	5.9	21.5	28.4	34.6	22.9	27.4	20.7
Mean	18.8	0.24	0.65	0.87	0.88	7.6	21.1	27.9	28.7	29.8	29.7	25.3
S.D.	4.2	0.04	0.08	0.06	0.11	2.0	5.0	4.0	7.1	6.1	2.9	6.2
S.E.	1.6	0.01	0.03	0.02	0.04	0.7	1.9	1.5	2.7	2.3	1.1	2.3
$\bar{X}_1 - \bar{X}_2$	-3.6	+0.09	+0.07	+0.07	+0.08	+2.4	+1.8	+1.2	+1.8	-1.0	+2.0	+0.2
%	83.9	160.0	112.1	108.8	110.0	146.2	109.3	104.5	106.7	96.8	107.2	100.8
P	0.044*	0.022*	0.071	0.32	0.040*	0.041*	0.14	0.57	0.14	0.79	0.097	0.83

Table 55. Comparison of bed-rest Day 2 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject		Plasma Total LDH, units/ml	Plasma LDH-1, units/ml	Plasma LDH-2, units/ml	Plasma LDH-3, units/ml	Plasma LDH-4, units/ml	Plasma LDH-5, units/ml	Circulating Total LDH, 1,000 units	Circulating LDH-1, 1,000 units	Circulating LDH-2, 1,000 units	Circulating LDH-3, 1,000 units	Circulating LDH-4, 1,000 units	Circulating LDH-5, 1,000 units
<u>Value 1-2 days before bed rest</u>													
STE	276	86.4	80.6	60.7	24.6	23.7	828	259	242	182	74	71	
BRO	294	79.7	85.8	71.1	32.6	24.7	1,205	327	352	291	134	101	
KUB	282	79.2	78.7	66.3	30.7	27.1	733	206	205	172	80	70	
CUT	257	79.7	58.3	38.3	25.2	55.5	1,025	318	233	153	100	221	
JON	260	74.6	65.3	46.3	30.9	42.9	806	231	202	144	96	133	
SHA	260	81.4	76.7	54.1	24.7	23.1	814	255	240	170	77	72	
JSM	257	88.2	80.4	50.4	15.7	22.4	894	307	279	175	55	78	
Mean	269	81.3	75.1	55.3	26.3	31.3	901	272	250	184	88	107	
S.D.	15	4.6	9.7	11.5	5.8	12.8	162	46	52	49	25	55	
S.E.	6	1.7	3.7	4.4	2.2	4.8	61	17	20	19	10	21	
<u>Value on Day 2 of bed rest</u>													
STE	275	84.4	77.3	46.5	31.6	35.2	811	249	228	137	93	104	
BRO	271	66.9	78.9	53.4	37.9	33.6	1,029	254	300	203	144	128	
KUB	236	58.1	63.7	48.1	29.5	36.6	559	138	151	114	70	86	
CUT	287	61.7	65.7	60.0	39.0	60.6	1,096	236	251	229	149	231	
JON	281	33.2	37.9	76.2	74.7	59.0	851	100	115	231	226	179	
SHA	305	54.0	63.7	67.1	66.2	54.0	939	166	196	207	204	166	
JSM	279	64.4	70.3	57.8	46.0	40.2	965	223	244	200	159	139	
Mean	276	60.4	65.4	58.4	46.4	45.6	893	195	212	189	149	148	
S.D.	21	15.4	13.6	10.6	17.4	11.8	177	61	63	45	55	49	
S.E.	8	5.8	5.1	4.0	6.6	4.5	67	23	24	17	21	19	
$\bar{X}_1 - \bar{X}_2$	+7	-20.9	-9.7	+3.1	+20.1	+14.3	-8	-77	-38	+5	+61	+41	
%	102.6	74.3	87.1	105.6	176.4	145.7	99.1	71.7	84.8	102.7	169.3	138.3	
P	0.59	0.004*	0.053	0.69	0.027*	0.004*	0.87	0.001*	0.022*	0.86	0.032*	0.010*	

Table 56. Comparison of bed-rest Day 6 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Body Weight, kg	Body Water, liters	Plasma Volume, liters	Red Cell Volume, liters	Blood Volume, liters	Body Hematocrit Value, %	Venous Hematocrit Value %	Body/Venous Hematocrit ratio	Blood Hemoglobin, g/100 ml	MCHC, g Hb/100 ml RBC	Circulating Hemoglobin, g	Plasma Potassium, meq/liter
<u>Value 1 day before bed rest</u>												
CUT	87.0	59.6	3.99	2.50	6.49	38.5	44.0	0.88	16.1	36.6	915	4.21
JON	74.0	53.2	3.10	2.24	5.34	41.9	48.5	0.86	17.3	35.7	800	4.29
SHA	71.1	51.8	3.13	2.58	5.71	45.2	51.5	0.88	17.9	34.8	898	4.29
JSM	89.2	59.9	3.48	2.57	6.05	42.5	48.0	0.89	16.7	34.8	894	4.04
MEI	83.6	--	--	--	--	45.0	--	16.8	37.3	--	--	4.25
GRI	91.7	50.0	3.23	2.39	5.62	42.5	48.5	0.88	17.8	36.7	877	4.41
Mean	82.8	54.9	3.39	2.45	5.84	42.1	47.6	0.88	17.1	36.0	877	4.25
S.D.	8.4	4.6	0.37	0.14	0.44	2.4	2.7	0.01	0.7	1.0	45	0.12
S.E.	3.4	2.0	0.17	0.06	0.20	1.1	1.1	0.01	0.3	0.4	20	0.05
<u>Value on Day 6 of bed rest</u>												
CUT	84.2	58.8	3.51	2.26	5.77	39.2	44.0	0.89	15.8	35.9	811	4.04
JON	72.5	52.0	2.68	1.98	4.66	42.5	47.5	0.89	17.2	36.2	717	4.04
SHA	68.0	51.0	2.92	2.38	5.30	44.9	52.5	0.86	18.6	35.4	843	4.38
JSM	80.9	58.7	3.16	2.28	5.44	41.9	48.5	0.86	17.5	36.1	823	4.12
MEI	82.4	--	--	--	--	46.0	--	16.4	35.7	--	--	4.12
GRI	88.8	49.4	2.98	2.27	5.25	43.2	49.0	0.88	17.5	35.7	810	4.12
Mean	79.5	54.0	3.05	2.23	5.28	42.3	47.9	0.88	17.2	35.8	801	4.14
S.D.	7.7	4.5	0.31	0.15	0.40	2.1	2.9	0.02	1.0	0.3	49	0.13
S.E.	3.2	2.0	0.14	0.07	0.18	0.9	1.2	0.01	0.4	0.1	22	0.05
$\bar{X}_1 - \bar{X}_2$	-3.3	-0.9	-0.34	-0.22	-0.56	+0.2	+0.3	0.00	+0.1	-0.2	-76	-0.11
%	96.0	98.2	90.0	91.0	90.4	100.5	100.6	100.0	100.6	99.4	91.3	97.4
P	0.026*	<0.001*	0.003*	0.002*	0.001*	0.47	0.33	0.86	0.77	0.76	<0.001*	0.15

Table 57. Comparison of bed-rest Day 6 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Plasma Sodium, meq/liter	Plasma Calcium, meq/liter	Plasma Magnesium, meq/liter	Plasma Chloride, meq/liter	Plasma Protein, g/100 ml	Plasma Albumin, g/100 ml	Plasma Globulins, g/100 ml	Plasma Fibrinogen, g/100 ml	Plasma Albumin/Globulin, ratio	Circ. Plasma Protein, g	Circulating Albumin, g	Circulating Globulins, g
<u>Value 1 day before bed rest</u>												
CUT	146	4.26	1.52	100.5	7.01	3.75	2.49	0.77	1.51	280	150	99.4
JON	146	4.54	1.72	103.5	6.53	3.44	2.39	0.70	1.44	202	107	74.1
SHA	144	4.70	1.52	100.5	7.04	3.37	2.80	0.87	1.20	220	105	87.6
JSM	144	4.54	1.64	102.5	7.32	3.89	2.79	0.64	1.39	255	135	97.1
MEI	146	4.70	1.68	101.5	6.82	3.69	2.54	0.59	1.45	--	--	--
GRI	<u>145</u>	<u>4.85</u>	<u>1.64</u>	<u>104.0</u>	<u>7.02</u>	<u>3.60</u>	<u>2.75</u>	<u>0.67</u>	<u>1.31</u>	<u>227</u>	<u>116</u>	<u>88.8</u>
Mean	<u>145</u>	<u>4.60</u>	<u>1.62</u>	<u>102.1</u>	<u>6.96</u>	<u>3.62</u>	<u>2.63</u>	<u>0.71</u>	<u>1.38</u>	<u>237</u>	<u>123</u>	<u>89.4</u>
S.D.	1	0.20	0.08	1.5	0.26	0.19	0.18	0.10	0.11	31	19	10.0
S.E.	1	0.08	0.03	0.6	0.11	0.08	0.07	0.04	0.05	14	9	4.5
<u>Value on Day 6 of bed rest</u>												
CUT	143	4.54	1.56	100.0	6.62	3.28	2.65	0.69	1.24	232	115	93.0
JON	144	4.70	1.72	103.5	6.54	3.39	2.57	0.58	1.32	175	91	68.9
SHA	144	4.85	1.60	101.0	7.46	3.54	3.18	0.74	1.11	218	103	92.9
JSM	143	4.70	1.56	99.0	6.95	3.22	3.13	0.60	1.03	220	102	98.9
MEI	146	4.70	1.69	105.0	7.10	3.65	2.71	0.74	1.35	--	--	--
GRI	<u>151</u>	<u>4.54</u>	<u>1.65</u>	<u>106.0</u>	<u>6.85</u>	<u>3.50</u>	<u>2.45</u>	<u>0.90</u>	<u>1.43</u>	<u>204</u>	<u>104</u>	<u>73.0</u>
Mean	<u>145</u>	<u>4.67</u>	<u>1.63</u>	<u>102.4</u>	<u>6.92</u>	<u>3.43</u>	<u>2.78</u>	<u>0.71</u>	<u>1.25</u>	<u>210</u>	<u>103</u>	<u>85.3</u>
S.D.	3	0.12	0.07	2.8	0.34	0.16	0.30	0.12	0.15	22	9	13.4
S.E.	1	0.05	0.03	1.2	0.14	0.07	0.12	0.05	0.06	10	4	6.0
$\bar{X}_1 - \bar{X}_2$	0	+0.07	+0.01	+0.3	-0.04	-0.19	+0.15	0.00	-0.13	-27	-20	-4.1
%	100.0	101.5	100.6	100.3	99.4	94.8	105.7	100.0	90.6	88.6	83.7	95.4
P	1.00	0.43	0.66	0.75	0.80	0.19	0.18	0.98	0.099	0.023*	0.036*	0.33

Table 58. Comparison of bed-rest Day 6 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Circulating Fibrinogen, g	Plasma $\alpha$ -1-Globulin, g/100 ml	Plasma $\alpha$ -2-Globulin, g/100 ml	Plasma $\beta$ -Globulin, g/100 ml	Plasma $\gamma$ -Globulin, g/100 ml	Circ. $\alpha$ -1-Globulin, g	Circ. $\alpha$ -2-Globulin, g	Circulating $\beta$ -Globulin, g	Circulating $\gamma$ -Globulin, g	Plasma ALP, units/liter	Plasma GOT, units/ml	Plasma GPT, units/ml
<u>Value 1 day before bed rest</u>												
CUT	30.7	0.18	0.56	0.86	0.89	7.2	22.3	34.3	35.5	36.0	35.9	42.5
JON	21.7	0.13	0.53	0.93	0.80	4.0	16.4	28.8	24.8	31.9	28.3	26.4
SHA	27.2	0.18	0.71	1.02	0.89	5.6	22.2	31.9	27.9	46.3	25.3	20.2
JSM	22.3	0.22	0.64	0.92	1.01	7.7	22.3	32.0	35.1	28.1	26.5	21.5
MEI	--	0.18	0.56	1.02	0.78	--	--	--	36.9	25.6	22.3	
GRI	21.6	0.25	0.71	0.80	0.99	8.1	22.9	25.8	32.0	23.8	26.8	23.4
Mean	24.7	0.19	0.62	0.93	0.89	6.5	21.2	30.6	31.1	33.8	28.1	26.1
S.D.	4.1	0.04	0.08	0.09	0.09	1.7	2.7	3.3	4.6	7.8	4.0	8.3
S.E.	1.8	0.02	0.03	0.04	0.04	0.8	1.2	1.5	2.1	3.2	1.6	3.4
<u>Value on Day 6 of bed rest</u>												
CUT	24.2	0.20	0.56	1.03	0.86	7.0	19.7	36.2	30.2	36.0	30.1	33.0
JON	15.5	0.29	0.55	0.98	0.75	7.8	14.7	26.3	20.1	32.3	28.9	25.0
SHA	21.6	0.25	0.80	1.11	1.02	7.3	23.4	32.4	29.8	54.1	26.4	20.7
JSM	19.0	0.24	0.71	0.90	1.28	7.6	22.4	28.4	40.4	35.6	26.1	19.2
MEI	--	0.17	0.59	1.03	0.92	--	--	--	48.5	25.1	20.4	
GRI	26.8	0.13	0.69	0.82	0.81	3.9	20.6	24.4	24.1	31.4	28.3	24.7
Mean	21.4	0.21	0.65	0.98	0.94	6.7	20.2	29.5	28.9	39.6	27.5	23.8
S.D.	4.4	0.06	0.10	0.10	0.19	1.6	3.4	4.8	7.7	9.4	1.9	5.1
S.E.	2.0	0.02	0.04	0.04	0.08	0.7	1.5	2.1	3.4	3.8	0.8	2.1
$\bar{X}_1 - \bar{X}_2$	-3.3	+0.02	+0.03	+0.05	+0.05	+0.2	-1.0	-1.1	-2.2	+5.8	-0.6	-2.3
%	86.6	110.5	104.8	105.4	105.6	103.1	95.3	96.4	92.9	117.2	97.9	91.2
P	0.21	0.56	0.12	0.11	0.51	0.89	0.22	0.36	0.43	0.027*	0.62	0.22

Table 59. Comparison of bed-rest Day 6 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Plasma Total LDH, units/ml	Plasma LDH-1, units/ml	Plasma LDH-2, units/ml	Plasma LDH-3, units/ml	Plasma LDH-4, units/ml	Plasma LDH-5, units/ml	Circulating Total LDH, 1,000 units	Circulating LDH-1, 1,000 units	Circulating LDH-2, 1,000 units	Circulating LDH-3, 1,000 units	Circulating LDH-4, 1,000 units	Circulating LDH-5, 1,000 units
<u>Value 1 day before bed rest</u>												
CUT	257	79.7	58.3	38.3	25.2	55.5	1,025	318	233	153	100	221
JON	260	74.6	65.3	46.3	30.9	42.9	806	231	202	144	96	133
SHA	260	81.4	76.7	54.1	24.7	23.1	814	255	240	170	77	72
JSM	257	88.2	80.4	50.4	15.7	22.4	894	307	279	175	55	78
MEI	271	42.3	77.2	84.8	43.1	23.6	--	--	--	--	--	--
GRI	294	60.9	98.8	74.1	34.1	26.2	950	197	319	239	110	85
Mean	267	71.2	76.1	58.0	29.0	32.3	898	262	255	176	88	118
S.D.	14	16.8	13.9	17.8	9.4	13.8	93	51	45	37	22	63
S.E.	6	6.9	5.7	7.2	3.8	5.6	41	23	20	17	10	28
<u>Value on Day 6 of bed rest</u>												
CUT	256	69.6	92.7	65.3	9.2	19.2	898	244	325	229	33	67
JON	267	83.3	86.5	59.3	16.0	21.9	716	223	232	159	43	59
SHA	269	83.4	90.9	64.6	15.1	15.1	786	244	265	189	44	44
JSM	262	89.3	85.9	48.2	19.4	19.4	828	282	272	152	61	61
MEI	250	71.3	70.5	58.0	12.5	37.5	--	--	--	--	--	--
GRI	259	66.8	78.7	63.2	19.2	31.1	772	199	235	188	57	93
Mean	261	77.3	84.2	59.8	15.2	24.0	800	238	266	183	48	65
S.D.	7	9.2	8.3	6.4	3.9	8.5	68	31	38	30	11	18
S.E.	3	3.8	3.4	2.6	1.6	3.5	30	14	17	14	5	8
$\bar{X}_1 - \bar{X}_2$	-6	+6.1	+8.1	+1.8	-13.8	-8.3	-98	-24	+11	+7	-40	-53
%	97.8	108.6	110.6	103.1	52.4	74.3	89.1	90.8	104.3	104.0	54.5	55.1
P	0.46	0.30	0.36	0.83	0.029*	0.32	0.019*	0.16	0.72	0.75	0.035*	0.14

Table 60. Comparison of bed-rest Day 12-13 values- for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Body Weight, kg	Body Water, liters	Plasma Volume, liters	Red Cell Volume, liters	Blood Volume, liters	Body Hematocrit Value, %	Venous Hematocrit Value, %	Body/Venous Hematocrit ratio	Blood Hemoglobin, g/100 ml	MCHC, g Hb/100 ml RBC	Circulating Hemoglobin, g	Plasma Potassium, meq/liter
<u>Value 1-2 days before bed rest</u>												
GRI	91.7	50.0	3.23	2.39	5.62	42.5	48.5	0.88	17.8	36.7	877	4.41
CAR	77.8	47.3	2.78	1.94	4.72	41.1	47.0	0.87	16.5	35.1	681	3.80
FIE	76.4	48.2	3.28	2.25	5.53	40.7	48.0	0.85	16.4	34.2	770	4.29
GOO	97.6	55.7	3.74	2.45	6.19	39.6	46.0	0.86	15.6	33.9	831	3.80
Mean	85.9	50.3	3.26	2.26	5.52	41.0	47.4	0.87	16.6	35.0	790	4.08
S.D.	10.4	3.8	0.39	0.23	0.61	1.2	1.1	0.01	0.9	1.3	85	0.32
S.E.	5.2	1.9	0.20	0.11	0.30	0.6	0.6	0.01	0.5	0.6	42	0.16
<u>Value on Day 12-13 of bed rest</u>												
GRI	93.7	49.2	3.18	2.25	5.43	41.4	47.0	0.88	16.3	34.7	781	3.88
CAR	79.5	46.5	2.76	1.85	4.61	40.1	43.5	0.92	15.7	36.1	668	3.88
FIE	78.2	47.2	3.16	2.13	5.29	40.3	47.0	0.86	16.2	34.5	735	4.12
GOO	93.2	54.8	3.51	2.41	5.92	40.7	46.0	0.88	15.5	33.7	812	3.75
Mean	86.2	49.4	3.15	2.16	5.31	40.6	45.9	0.89	15.9	34.8	749	3.91
S.D.	8.4	3.8	0.31	0.24	0.54	0.6	1.7	0.03	0.4	1.0	63	0.15
S.E.	4.2	1.9	0.15	0.12	0.27	0.3	0.8	0.01	0.2	0.5	31	0.08
$\bar{X}_1 - \bar{X}_2$	+0.3	-0.9	-0.11	-0.10	-0.21	-0.4	-1.5	+0.02	-0.7	-0.2	-41	-0.17
%	100.3	98.2	96.6	95.6	96.2	99.0	96.8	102.3	95.8	99.4	94.8	95.8
P	0.87	<0.001*	0.11	0.021*	0.010*	0.54	0.13	0.15	0.14	0.75	0.12	0.29

Table 61. Comparison of bed-rest Day 12-13 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Plasma Sodium, meq/liter	Plasma Calcium, meq/liter	Plasma Magnesium, meq/liter	Plasma Chloride, meq/liter	Plasma Protein, g/100 ml	Plasma Albumin, g/100 ml	Plasma Globulins, g/100 ml	Plasma Fibrinogen, g/100 ml	Plasma Albumin/Globulin ratio	Circ. Plasma Protein, g	Circulating Albumin, g	Circulating Globulins, g
<u>Value 1-2 days before bed rest</u>												
GRI	145	4.85	1.64	104.0	7.02	3.60	2.75	0.67	1.31	227	116	88.8
CAR	145	4.84	1.72	106.0	7.15	4.04	2.56	0.55	1.58	199	112	71.2
FIE	147	4.84	1.80	108.5	6.77	3.41	2.66	0.70	1.28	222	112	87.2
GOO	145	4.53	1.56	105.5	7.08	3.70	2.73	0.65	1.36	265	138	102.1
Mean	145	4.77	1.68	106.0	7.01	3.69	2.68	0.64	1.38	228	120	87.3
S.D.	1	0.16	0.10	1.9	0.17	0.26	0.09	0.06	0.14	27	12	12.7
S.E.	1	0.08	0.05	0.9	0.08	0.13	0.04	0.03	0.07	14	6	6.3
<u>Value on Day 12-13 of bed rest</u>												
GRI	145	4.54	1.58	103.5	6.78	3.48	2.50	0.80	1.39	216	111	79.5
CAR	143	5.00	1.62	99.0	7.05	3.97	2.35	0.73	1.69	195	110	64.9
FIE	145	4.70	1.62	102.0	6.60	3.95	2.03	0.62	1.95	209	125	64.1
GOO	145	4.70	1.62	100.5	6.95	3.93	2.41	0.61	1.63	244	138	84.6
Mean	144	4.74	1.61	101.3	6.85	3.83	2.32	0.69	1.66	216	121	73.3
S.D.	1	0.19	0.02	1.9	0.20	0.24	0.20	0.09	0.23	21	13	10.3
S.E.	1	0.10	0.01	1.0	0.10	0.12	0.10	0.05	0.11	10	7	5.2
$\bar{X}_1 - \bar{X}_2$	-1	-0.03	-0.07	-4.7	-0.16	+0.14	-0.36	+0.05	+0.28	-12	+1	-14.0
%	99.3	99.4	95.8	95.6	97.7	103.8	86.6	107.8	120.3	94.7	100.8	84.0
P	0.18	0.82	0.26	0.049*	0.013*	0.41	0.034*	0.51	0.13	0.039*	0.73	0.035*

Table 62. Comparison of bed-rest Day 12-13 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Circulating Fibrinogen, g	Plasma $\alpha$ -1-Globulin, g/100 ml	Plasma $\alpha$ -2-Globulin, g/100 ml	Plasma $\beta$ -Globulin, g/100 ml	Plasma $\gamma$ -Globulin, g/100 ml	Circ. $\alpha$ -1-Globulin, g	Circ. $\alpha$ -2-Globulin, g	Circulating $\beta$ -Globulin, g	Circulating $\gamma$ -Globulin, g	Plasma ALP, units/liter	Plasma GOT, units/ml	Plasma GPT, units/ml
<u>Value 1-2 days before bed rest</u>												
GRI	21.6	0.25	0.71	0.80	0.99	8.1	22.9	25.8	32.0	23.8	26.8	23.4
CAR	15.3	0.19	0.63	1.02	0.72	5.3	17.5	28.4	20.0	31.1	26.6	22.5
FIE	23.0	0.26	0.79	0.92	0.69	8.5	25.9	30.2	22.6	27.4	25.4	20.4
GOO	24.3	0.20	0.63	0.92	0.98	7.5	23.6	34.4	36.7	32.5	25.1	22.4
Mean	21.0	0.23	0.69	0.92	0.85	7.3	22.5	29.7	27.8	28.7	26.0	22.2
S.D.	4.0	0.04	0.08	0.09	0.16	1.4	3.6	3.6	7.8	3.9	0.9	1.3
S.E.	2.0	0.02	0.04	0.04	0.08	0.7	1.8	1.8	3.9	2.0	0.4	0.6
<u>Value on Day 12-13 of bed rest</u>												
GRI	25.4	0.21	0.66	0.76	0.87	6.7	21.0	24.2	27.7	28.3	28.1	24.2
CAR	20.1	0.20	0.56	0.93	0.66	5.5	15.5	25.7	18.2	30.7	25.1	20.9
FIE	19.6	0.12	0.53	0.85	0.53	3.8	16.7	26.9	16.7	31.0	26.5	24.0
GOO	21.4	0.14	0.47	0.78	1.02	4.9	16.5	27.4	35.8	17.0	25.4	23.0
Mean	21.6	0.17	0.56	0.83	0.77	5.2	17.4	26.1	24.6	26.8	26.3	23.0
S.D.	2.6	0.04	0.08	0.08	0.22	1.2	2.4	1.4	8.9	6.6	1.4	1.5
S.E.	1.3	0.02	0.04	0.04	0.11	0.6	1.2	0.7	4.5	3.3	0.7	0.8
$\bar{X}_1 - \bar{X}_2$	+0.6	-0.06	-0.13	-0.09	-0.08	-2.1	-5.1	-3.6	-3.2	-1.9	+0.3	+0.8
%	102.9	73.9	81.2	90.2	90.6	62.7	77.3	87.9	88.5	93.4	101.2	103.6
P	0.81	0.16	0.067	0.027*	0.18	0.13	0.071	0.053	0.067	0.70	0.67	0.48

Table 63. Comparison of bed-rest Day 12-13 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Plasma Total LDH, units/ml	Plasma LDH-1, units/ml	Plasma LDH-2, units/ml	Plasma LDH-3, units/ml	Plasma LDH-4, units/ml	Plasma LDH-5, units/ml	Circulating Total LDH, 1,000 units	Circulating LDH-1, 1,000 units	Circulating LDH-2, 1,000 units	Circulating LDH-3, 1,000 units	Circulating LDH-4, 1,000 units	Circulating LDH-5, 1,000 units
<u>Value 1-2 days before bed rest</u>												
GRI	294	60.9	98.8	74.1	34.1	26.2	950	197	319	239	110	85
CAR	267	56.3	81.7	57.9	36.8	34.2	742	157	227	161	102	95
FIE	285	56.4	76.7	67.5	37.6	46.7	935	185	252	222	123	153
GOO	264	51.5	81.3	66.8	33.8	30.4	987	193	304	250	126	114
Mean	278	56.3	84.6	66.6	35.6	34.4	904	183	275	218	115	112
S.D.	14	3.8	9.7	6.7	1.9	8.8	110	18	43	40	11	30
S.E.	7	1.9	4.9	3.3	1.0	4.4	55	9	22	20	6	15
<u>Value on Day 12-13 of bed rest</u>												
GRI	245	65.7	100.0	56.1	2.7	20.6	779	209	318	178	9	65
CAR	259	85.5	96.6	45.6	7.5	24.1	715	236	266	126	21	66
FIE	256	65.0	95.5	57.1	13.3	25.1	809	205	302	181	42	79
GOO	237	62.1	100.3	56.2	1.9	16.6	832	218	352	197	7	58
Mean	249	69.6	98.1	53.8	6.4	21.6	784	217	309	171	20	67
S.D.	10	10.7	2.4	5.5	5.3	3.9	51	14	36	31	16	9
S.E.	5	5.4	1.2	2.7	2.6	1.9	25	7	18	15	8	4
$\bar{X}_1 - \bar{X}_2$	-29	+13.3	+13.5	-12.8	-29.2	-12.8	-120	+34	+34	-47	-95	-45
%	89.6	123.6	116.0	80.8	18.0	62.8	86.7	118.6	112.4	78.4	17.4	59.8
P	0.043*	0.092	0.049*	0.005*	<0.001*	0.033*	0.034*	0.11	0.065	0.004*	0.002*	0.036*

Table 64. Comparison of bed-rest Day 19 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Body Weight, kg	Body Water, liters	Plasma Volume, liters	Red Cell Volume, liters	Blood Volume, liters	Body Hematocrit Value, %	Venous Hematocrit Value, %	Body/Venous Hematocrit ratio	Blood Hemoglobin, g/100 ml	MCHC, g Hb/100 ml RBC	Circulating Hemoglobin, g	Plasma Potassium, meq/liter
<u>Value 2 days before bed rest</u>												
CAR	77.8	47.3	2.78	1.94	4.72	41.1	47.0	0.87	16.5	35.1	681	3.80
FIE	76.4	48.2	3.28	2.25	5.53	40.7	48.0	0.85	16.4	34.2	770	4.29
GOO	97.6	55.7	3.74	2.45	6.19	39.6	46.0	0.86	15.6	33.9	831	3.80
Mean	83.9	50.4	3.27	2.21	5.48	40.5	47.0	0.86	16.2	34.4	761	3.96
S.D.	11.9	4.6	0.48	0.26	0.74	0.8	1.0	0.01	0.5	0.6	75	0.28
S.E.	6.8	2.7	0.28	0.15	0.43	0.4	0.6	0.01	0.3	0.4	44	0.16
<u>Value on Day 19 of bed rest</u>												
CAR	76.1	46.5	2.61	1.73	4.34	39.9	46.5	0.86	16.7	35.9	621	3.92
FIE	77.6	47.7	2.93	1.97	4.90	40.2	46.0	0.87	16.4	35.7	703	4.04
GOO	92.5	54.0	3.47	2.32	5.79	40.1	46.5	0.86	16.3	35.1	814	3.92
Mean	82.1	49.4	3.00	2.01	5.01	40.1	46.3	0.86	16.5	35.6	713	3.96
S.D.	9.1	4.0	0.43	0.30	0.73	0.2	0.3	0.01	0.2	0.4	97	0.07
S.E.	5.2	2.3	0.25	0.7	0.42	0.1	0.2	0.01	0.1	0.2	56	0.04
$\bar{X}_1 - \bar{X}_2$	-1.8	-1.0	-0.27	-0.20	-0.47	-0.4	-0.7	0.00	+0.3	+1.2	-48	0.00
%	97.9	98.0	91.7	91.0	91.4	99.0	98.5	100.0	101.9	103.5	93.7	100.0
P	0.41	0.11	0.037*	0.041*	0.028*	0.50	0.46	0.73	0.29	0.029*	0.092	0.98

Table 65. Comparison of bed-rest Day 19 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Plasma Sodium, meq/liter	Plasma Calcium, meq/liter	Plasma Magnesium, meq/liter	Plasma Chloride, meq/liter	Plasma Protein, g/100 ml	Plasma Albumin, g/100 ml	Plasma Globulins, g/100 ml	Plasma Fibrinogen, g/100 ml	Plasma Albumin/Globulin, ratio	Circ. Plasma Protein, g	Circulating Albumin, g	Circulating Globulins, g
<u>Value 2 days before bed rest</u>												
CAR	145	4.84	1.72	106.0	7.15	4.04	2.56	0.55	1.58	199	112	71.2
FIE	147	4.84	1.80	108.5	6.77	3.41	2.66	0.70	1.28	222	112	87.2
GOO	145	4.53	1.56	105.5	7.08	3.70	2.73	0.65	1.36	265	138	102.1
Mean	146	4.74	1.69	106.7	7.00	3.72	2.65	0.63	1.41	229	121	86.8
S.D.	1	0.18	0.12	1.6	0.20	0.32	0.09	0.08	0.16	34	15	15.5
S.E.	1	0.10	0.07	0.9	0.12	0.18	0.05	0.04	0.09	19	9	8.9
<u>Value on Day 19 of bed rest</u>												
CAR	140	4.85	1.72	103.5	7.13	3.94	2.46	0.73	1.60	186	103	64.2
FIE	139	4.56	1.68	103.5	6.21	3.65	1.90	0.66	1.92	182	107	55.7
GOO	144	4.70	1.64	102.0	6.82	3.98	2.34	0.50	1.70	237	138	81.2
Mean	141	4.70	1.68	103.0	6.72	3.86	2.23	0.63	1.74	202	116	67.0
S.D.	3	0.15	0.04	0.9	0.47	0.18	0.29	0.12	0.16	31	19	13.0
S.E.	2	0.08	0.02	0.5	0.27	0.10	0.17	0.07	0.09	18	11	7.5
$\bar{X}_1 - \bar{X}_2$	-5	-0.04	-0.01	-3.7	-0.28	+0.14	-0.42	0.00	+0.33	-27	-5	-19.8
%	96.6	99.2	99.4	96.5	96.0	103.8	84.2	100.0	123.4	88.2	95.9	77.2
P	0.15	0.82	0.84	0.037*	0.21	0.37	0.16	0.98	0.20	0.074	0.21	0.11

Table 66. Comparison of bed-rest Day 19 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Circulating Fibrinogen, g	Plasma $\alpha$ -1-Globulin, g/100 ml	Plasma $\alpha$ -2-Globulin, g/100 ml	Plasma $\beta$ -Globulin, g/100 ml	Plasma $\gamma$ -Globulin, g/100 ml	Circ. $\alpha$ -1-Globulin, g	Circ. $\alpha$ -2-Globulin, g	Circulating $\beta$ -Globulin, g	Circulating $\gamma$ -Globulin, g	Plasma ALP, units/liter	Plasma GOT, units/ml	Plasma GPT, units/ml
<u>Value 2 days before bed rest</u>												
CAR	15.3	0.19	0.63	1.02	0.72	5.3	17.5	28.4	20.0	31.1	26.6	22.5
FIE	23.0	0.26	0.79	0.92	0.69	8.5	25.9	30.2	22.6	27.4	25.4	20.4
GOO	24.3	0.20	0.63	0.92	0.98	7.5	23.6	34.4	36.7	32.5	25.1	22.4
Mean	20.9	0.22	0.68	0.95	0.80	7.1	22.3	31.0	26.4	30.3	25.7	21.8
S.D.	4.9	0.04	0.09	0.06	0.16	1.6	4.3	3.1	9.0	2.6	0.8	1.2
S.E.	2.8	0.02	0.05	0.03	0.09	0.9	2.5	1.8	5.2	1.5	0.5	0.7
<u>Value on Day 19 of bed rest</u>												
CAR	19.1	0.19	0.57	0.99	0.71	5.0	14.9	25.8	18.5	31.0	26.2	20.0
FIE	19.3	0.11	0.51	0.77	0.51	3.2	14.9	22.6	14.9	32.6	26.1	26.8
GOO	17.4	0.11	0.39	0.81	1.03	3.8	13.5	28.1	35.7	17.3	25.4	22.9
Mean	18.6	0.14	0.49	0.86	0.75	4.0	14.4	25.5	23.0	27.0	25.9	23.2
S.D.	1.0	0.05	0.09	0.12	0.26	0.9	0.8	2.8	11.1	8.4	0.4	3.4
S.E.	0.6	0.03	0.05	0.07	0.15	0.5	0.5	1.6	6.4	4.9	0.3	2.0
$\bar{X}_1 - \bar{X}_2$	-2.3	-0.08	-0.19	-0.09	-0.05	-3.1	-7.9	-5.5	-3.4	-3.3	+0.2	+1.4
%	89.0	63.6	72.1	90.5	93.8	56.3	64.6	82.3	87.1	89.1	100.8	106.4
P	0.55	0.21	0.10	0.11	0.57	0.17	0.097	0.067	0.26	0.64	0.60	0.63

Table 67. Comparison of bed-rest Day 19 values for various blood parameters with the base values for subjects of the 1974 NASA/Ames Time Course Bed-Rest Study.

Subject	Plasma Total LDH, units/ml	Plasma LDH-1, units/ml	Plasma LDH-2, units/ml	Plasma LDH-3, units/ml	Plasma LDH-4, units/ml	Plasma LDH-5, units/ml	Circulating Total LDH, 1,000 units	Circulating LDH-1, 1,000 units	Circulating LDH-2, 1,000 units	Circulating LDH-3, 1,000 units	Circulating LDH-4, 1,000 units	Circulating LDH-5, 1,000 units
<u>Value 2 days before bed rest</u>												
CAR	267	56.3	81.7	57.9	36.8	34.2	742	157	227	161	102	95
FIE	285	56.4	76.7	67.5	37.6	46.7	935	185	252	222	123	153
GOO	264	51.5	81.3	66.8	33.8	30.4	987	193	304	250	126	114
Mean	272	54.7	79.9	64.1	36.1	37.1	888	178	261	211	117	121
S.D.	11	2.8	2.8	5.4	2.0	8.5	129	19	39	46	13	30
S.E.	7	1.6	1.6	3.1	1.2	4.9	75	11	23	26	8	17
<u>Value on Day 19 of bed rest</u>												
CAR	267	105.5	107.9	45.7	0.3	8.0	697	275	281	119	0.8	21
FIE	254	93.0	105.2	51.6	0.4	4.1	744	272	308	151	1.2	12
GOO	253	71.1	110.6	66.3	0.2	4.8	878	247	383	230	0.7	17
Mean	258	89.9	107.9	54.5	0.3	5.6	773	265	324	167	0.9	17
S.D.	8	17.4	2.7	10.6	0.1	2.1	94	15	53	57	0.3	5
S.E.	5	10.1	1.6	6.1	0.1	1.2	54	9	31	33	0.2	3
$\bar{X}_1 - \bar{X}_2$	-14	+35.2	+28.0	-9.6	-35.8	-31.5	-115	+87	+63	-44	-116	-104
%	94.9	164.4	135.0	85.0	0.8	15.1	87.0	148.9	124.1	79.1	0.8	14.0
P	0.26	0.055	0.001*	0.18	<0.001*	0.030*	0.11	0.043*	0.016*	0.095	0.004*	0.034*

**Table 68.** Summary of percentage changes from the pre-bed-rest mean value on various days during the course of continuous recumbency. The percentages statistically significantly different from the base value of 100% ( $P < 0.05$ ) are indicated by an asterisk.

Parameter	Day 2	Day 6	Day 12-13	Day 19
Body Weight	100.1	96.0*	100.3	97.9
Body Water	98.9*	98.2*	98.2*	98.0
Plasma Volume	96.4*	90.0*	96.6	91.7*
Red Cell Volume	95.8*	91.0*	95.6*	91.0*
Blood Volume	96.2*	90.4*	96.2*	91.4*
Body Hematocrit	99.8	100.5	99.0	99.0
Venous Hematocrit	101.5	100.6	96.8	98.5
Body/Venous Hct	98.9	100.0	102.3	100.0
Blood Hemoglobin	101.8	100.6	95.8	101.9
MCHC	100.6	99.4	99.4	103.5*
Circulating Hb	96.1*	91.3*	94.8	93.7
Plasma Potassium	100.0	97.4	95.8	100.0
Plasma Sodium	101.4	100.0	99.3	96.6
Plasma Calcium	103.8*	101.5	99.4	99.2
Plasma Magnesium	100.6	100.6	95.8	99.4
Plasma Chloride	101.3	100.3	95.6*	96.5*
Plasma Total Protein	99.5	99.4	97.7*	96.0
Plasma Albumin	93.0*	94.8	103.8	103.8
Plasma Globulin	113.3	105.7	86.6*	84.2
Plasma Fibrinogen	86.6	100.0	107.8	100.0
Albumin/Globulin	78.8*	90.6	120.3	123.4
Circ. Plasma Protein	95.9	88.6*	94.7*	88.2
Circ. Albumin	88.3*	83.7*	100.8	95.9
Circ. Globulin	109.1	95.4	84.0*	77.2
Circ. Fibrinogen	83.9*	86.6	102.9	89.0
Plasma $\alpha$ -1 Globulin	160.0*	110.5	73.9	63.6
Plasma $\alpha$ -2 Globulin	112.1	104.8	81.2	72.1
Plasma $\beta$ -Globulin	108.8	105.4	90.2*	90.5
Plasma $\gamma$ -Globulin	110.0*	105.6	90.6	93.8
Circ. $\alpha$ -1-Globulin	146.2*	103.1	62.7	56.3
Circ. $\alpha$ -2-Globulin	109.3	95.3	77.3	64.6
Circ. $\beta$ -Globulin	104.5	96.4	87.9	82.3
Circ. $\gamma$ -Globulin	106.7	92.9	88.5	87.1
Plasma ALP	96.8	117.2*	93.4	89.1
Plasma GOT	107.2	97.9	101.2	100.8
Plasma GPT	100.8	91.2	103.6	106.4
Plasma Total LDH	102.6	97.8	89.6*	94.9
Plasma LDH-1	74.3*	108.6	123.6	164.4
Plasma LDH-2	87.1	110.6	116.0*	135.0*
Plasma LDH-3	105.6	103.1	80.8*	85.0
Plasma LDH-4	176.4*	52.4*	18.0*	0.8*
Plasma LDH-5	145.7*	74.3	62.8*	15.1*
Circ. Total LDH	99.1	89.1*	86.7*	87.0
Circ. LDH-1	71.7*	90.8	118.6	148.9*
Circ. LDH-2	84.8*	104.3	112.4	124.1*
Circ. LDH-3	102.7	104.0	78.4*	79.1
Circ. LDH-4	169.3*	54.5*	17.4*	0.8*
Circ. LDH-5	138.3*	55.1	59.8*	14.0*